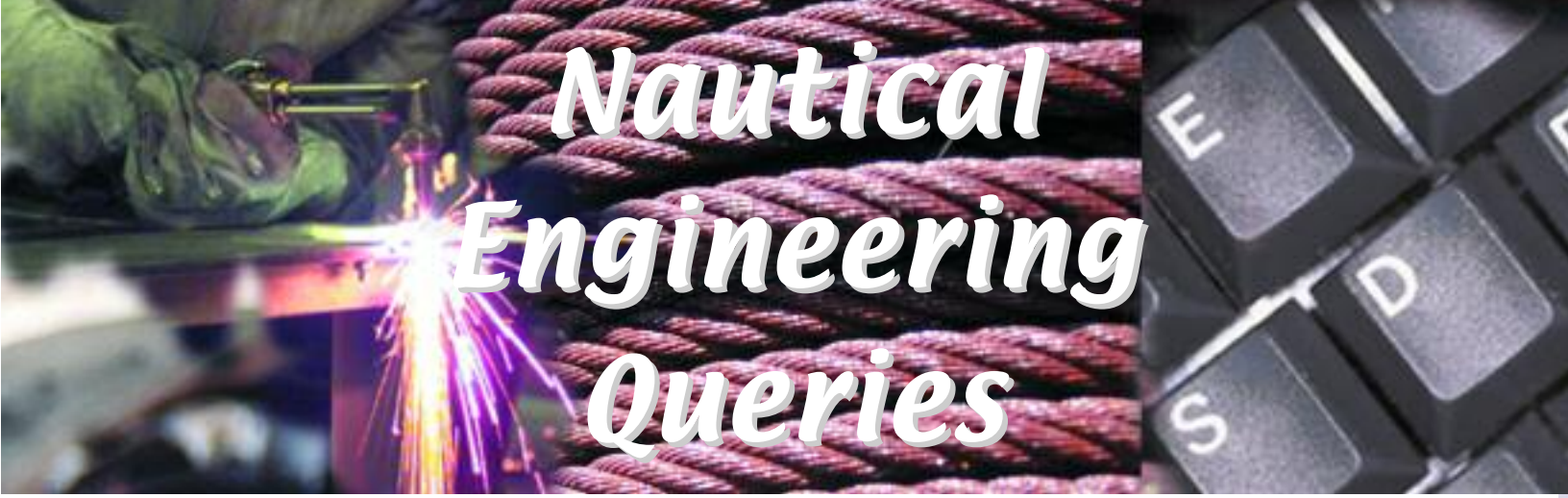

1. Which statement is true concerning two-stage air ejector assemblies?

Note: A "Jet pump" is a sub-classification of dynamic pumps, such as eductors, hydrokineters, and of course air ejectors. These units are used to move fluids through the inter-active change in the kinetic energy of the motivating fluid.

A. Air is removed from the condensate as it passes through the tubes.
Incorrect Answer: Air ejectors are designed to remove air and non-condensable gases which tend to accumulate in the condenser. Air cannot be removed from the condensate passing through the tubes of the inter and after-condenser. The main condensate in the tubes merely serves as the cooling medium to condense the steam exhausting from the air ejector assemblies.

B. In the after-condenser, the air ejector motivating steam is condensed and returned to the main condenser via the loop seal.
Incorrect Answer: In the after-condenser (second stage), the air ejector motivating steam is condensed and returned to the condensate system via the atmospheric drain tank. In the inter-condenser (first stage), the air ejector motivating steam is returned to the main condenser via the loop seal.

C. The first stage air ejector takes suction on the second stage to increase vacuum.
Incorrect Answer: The first stage air ejector takes suction on the main condenser, and the second stage air ejector takes suction on the first stage inter-condenser, which when operating together results in a condenser vacuum of approximately 28.5 inches of mercury.

D. The steam/air mixture from the main condenser is discharged by the first stage jet pump to the inter-condenser.
Correct Answer: The steam/air mixture drawn from the main condenser is discharged by the first stage (air ejector) jet pump into the inter-condenser. As the exhaust steam condenses, a loop seal directs the condensate to the main condenser while the air and non-condensable gases are drawn out by the second stage (air ejector) jet pump. The resultant second stage steam, air and non-condensable gas mixture is discharged into the after-condenser, where the steam condenses and drains to the atmospheric drain tank, while the air and non-condensable gases are vented to the atmosphere.

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2. When metal is tempered, it becomes _____.

Note: Tempering, or drawing, is the process of reducing both the degree of hardness and strength of a metal by reducing its brittleness. Hardness is a property of metal that relates its resistance to indentation, and is a function of the percentage of its carbon content. The higher the percentage of carbon content, the harder the metal, and characterized as being more brittle. A brittle metal will break easily and without noticeable deformation (without warning). Soft metal has a conversely lower percentage of carbon, and is used where high strength is not a concern as it becomes more plastic. Softer metals are easier to handle and fabricate.

A. harder
Incorrect Answer: Tempering decreases the hardness of metal.

B. corrosion resistant
Incorrect Answer: Tempering has no effect on corrosion resistance as this is a function of its iron composition and associated alloys.

C. less brittle
Correct Answer: Tempering is the process of controlled heating and cooling of metal to lessen its brittleness.

D. more brittle
Incorrect Answer: Tempering reduces the brittleness of the metal, rendering it less susceptible to fractures.

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3. Which statement is true concerning operational factors affecting the degree of superheat in a single furnace boiler?

Note: Operational factors that affect the degree of superheat in a single furnace boiler include rate of combustion, temperature relationship of the feed water to its design requirements, amount of excess air passing through the furnace, amount of moisture entrained in the steam generated, and the condition of the superheater and water screen tube surfaces.

A. As the rate of combustion increases, the degree of superheat increases throughout the entire firing range.
Incorrect Answer: An increase in steam demand results in an increase in the rate of combustion, that results in an increase in sat-

urated steam generating rate, which in turn results in an increased steam flow through the superheater. The rate of heat absorption by the steam flowing through the superheater increases more rapidly than the increasing rate of steam flow and the superheat temperature while increasing, rises slowly at first until the boiler is operating at near full power. At full power, the rate of steam flow stabilizes resulting in the rate of heat absorption in the superheater to decrease, and the degree of superheat ceases to increase and may decrease slightly even though the rate of combustion had increased.

B. With a constant firing rate and steam consumption equal to generation, a decrease in the incoming feed water temperature results in a superheat temperature decrease.

Incorrect Answer: At a constant firing rate, a decrease in feedwater temperature will result in a superheat temperature increase. If the feedwater temperature decreases, less saturated steam will be generated for the load and the quantity of the fuel being burned. The reduction in steam flow will also result in the corresponding steam pressure, forcing the combustion control to increase the rate of combustion. The resulting increasing combustion airflow results in deeper combustion gas penetration into the generating tube bank. The available heat no longer available to effectively heat the water in the water screen tubes is now increasingly transferred to the superheater, resulting in an increase in the superheater outlet temperature.

C. With large amounts of excess air, superheater outlet temperature will decrease due to lack of sufficient time for heat transfer to take place.

Incorrect Answer: A large amount of excess air repositions the "center" of combustion closer to the superheater tube bank. The available heat no longer available to effectively heat the water in the water screen tubes is now increasingly transferred to the superheater, resulting in an increase in the superheater outlet temperature.

D. Carrying boiler water total dissolved solids higher than normal could result in a decrease in the degree of superheat.

Correct Answer: Carrying the boiler water total dissolved solids higher than normal may result in moisture carryover into the superheater. Consequently, much of the available heat will be given up to transform the entrained moisture to steam before the addition of sensible heat to the saturated steam can occur to increase the temperature in the superheater, thereby resulting in a decrease to the superheat outlet temperature.

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4. When troubleshooting an alkaline storage battery, a weak or dead cell is best located by _____.

A. checking the specific gravity of each cell

Incorrect Answer: The specific gravity of the electrolyte (potassium hydroxide) in an alkaline (nickel-cadmium) battery is 1.200 at 60°F, and essentially remains constant, regardless of charge. Therefore, checking the specific gravity would be ineffective in locating a weak or dead cell.

B. visually inspecting each cell's electrolyte level

Incorrect Answer: The cell's electrolyte level is not an indication of the state of charge. However, maintaining the electrolyte at the "full mark", by the addition of distilled water, would result in less space inside the battery for the accumulation of explosive hydrogen and oxygen gases.

C. load testing each cell with a voltmeter

Correct Answer: Because the specific gravity of the electrolyte is essentially constant, regardless of charge, the battery condition must be determined with a voltmeter such as a digital voltmeter, during charging or discharging. Open circuit voltage of a nickel-cadmium battery is 1.2 volts per cell, and when connected to a load, remains fairly constant up to 90 percent of its rated capacity. Repeated over-discharging below 1.1 volts per cell will damage the battery.

D. measuring the electrolyte temperature with an accurate mercury thermometer

Incorrect Answer: The electrolyte temperature does not provide an indication of the state of charge or discharge of an alkaline battery. However, to limit gassing, the electrolyte temperature should not be allowed to exceed 115°F (46°C) when charging the battery. In addition, a mercury thermometer should never be used to measure electrolyte temperature, as an accidental breakage of the thermometer could result in sparking and an explosion.